

NORSK POLARINSTITUTT



ÅRBOK 1985





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**The Annual Report
of the Norwegian Polar
Research Institute**

NORSK POLARINSTITUTT
OSLO 1986

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The expedition ship K/V ANDENES was an object of great interest for the original inhabitants of Antarctica, the penguins, during the NARE expedition 1984/85

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Annual Report of the Norwegian Polar Research Institute

Norsk Polarinstitutt (NP) is Norway's central institute for the scientific research of Svalbard, Jan Mayen, the polar seas and the Norwegian dependencies in the Antarctic and for the mapping of the Norwegian polar land areas. Apart from its own mapping and research within the fields of geology, geophysics and biology, Norsk Polarinstitutt also acts as an advisor and coordinator for other Norwegian and foreign scientific expeditions to Svalbard.

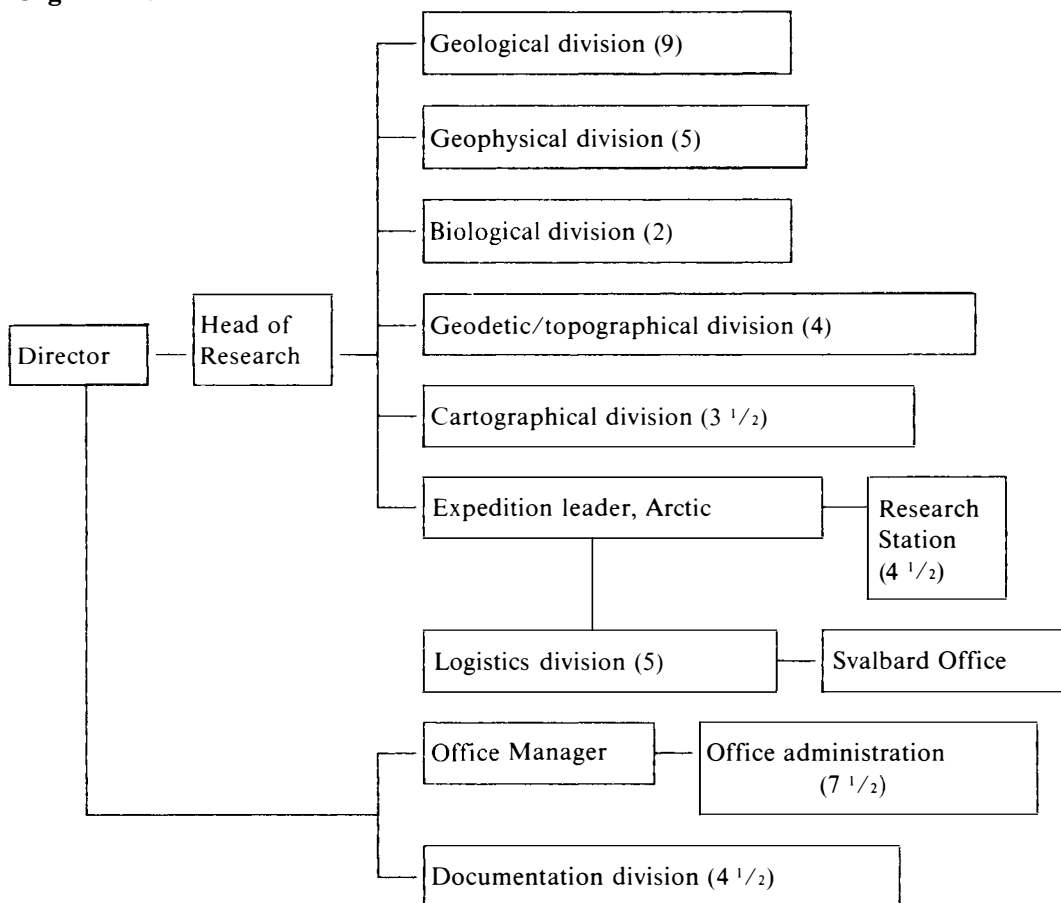
Personnel

Director: Odd Rogne
Research director: Jan A. Holtet
No. of permanent posts: 42 $\frac{1}{2}$
No. of temporary posts: 4 $\frac{1}{2}$
Contracted personnel: 7

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Organization



The past year

Norway restarted its regular summer expedition activity in Antarctica at the beginning of 1985, when the Norwegian Antarctic Research Expedition (NARE) 1984/85 was in full operation. Scientists and personnel from the Institute and other Norwegian research institutions participated. A visiting Swedish scientist was also a member of the expedition. Further details on the Antarctic expedition are to be found on pages 12–15.

Another important event of the year was the discussions in the Parliament of the Parliamentary paper No. 26 (1982-83) concerning environmental protection, mapping and research in the polar areas. The Parliament concluded that there was a need for a fundamental strengthening of Norsk Polarinstitutt and a recommendation was made to develop plans for escalating mapping and research in Norwegian polar areas. As to Antarctic activities, the Parliament fully supported the government's decision to send regular summer expeditions. In addition, the Parliament requested a proposal for a Norwegian all-year station in Antarctica.

The most significant development in Norwegian polar areas in 1985 was the increase in activities by oil- and other private companies in Svalbard. Although this increase of effort started the previous year, the growth was substantial in 1985 and is anticipated to continue. As a result the demand for information and other services provided by the Institute has been greater than in the past.

The consequences on the environment of growing industrial activity is of concern to the Institute as well as to the Ministry of the Environment. The Ministry asked the Institute to start planning investigations into effects on the environment created by the activities of oil and other industrial companies. The study of environmental effects of oil exploration in the Barents Sea and possible effects of oil spills, etc., requires a large-scale collection of data on the physical environment as well as on the ecological system. Similar investigations are needed to ascertain the effects on land. A planning coordinator was appointed to the Institute in the late autumn. The Institute's work and develop-

ment will be heavily influenced by these investigations.

The field operations were at a normal level with smaller groups working during winter, and the main field work concentrated on the summer expedition. Priority on this expedition was given to topographic measurements and related mapping activities. The Geographical Survey of Norway (NGO), being responsible for gravity measurements and the first order triangulation network, was invited to join the expedition. Several contracted scientists took part working on biological registrations and thematical mapping. Further details are found later in this report and in the field report published as NP Report No. 25, 1985.

The Institute has suffered from lack of sufficient office and laboratory space for many years. The logistics department has had a special problem, with its equipment stored in several places throughout the town. This situation was improved in 1985 by the hiring of new premises for the department, enabling all equipment to be collected in one place.

The Directorate of Organization and Management worked on the Institute organization most of the year and produced a draft report in December. No major changes were recommended.

Appointments

Biologist Thor Larsen received his Dr.philos. degree with a thesis entitled *Abundance, Range and Population Biology of the Polar Bear (Ursus maritimus) in the Svalbard Area*. Glaciologist Olav Orheim was elected Secretary/Chairman of SCAR's Working Group on Glaciology.

Field work

The NARE 1984/85 expedition was underway at the beginning of the year, and 77 persons (28 scientists) were involved in the field until the expedition returned home in March.



Fig. 1. The routes of the two LANCE cruises in the summer of 1985.

A total of 133 persons took part in the Institute's field programmes in the Svalbard area, of which 26 were from the Institute's staff, 29 were engaged professional personnel and field assistants, 40 were scientists involved in co-operation projects, and 38 were the crew of the ship and helicopters. A number of other programmes were supported logistically, and/or financially through the scholarship account (see page 42).

A. Svalbard

1. Scientific cruises

Two scientific cruises were carried out with the expedition ship *m/s Lance* resulting in a circumnavigation of almost the entire archipelago. Conditions were unusually good also this summer, and a minimum of sea ice was encountered, even in the far north-eastern part of Svalbard.

Both cruises concentrated on geodetic and topographic activities which will improve the mapping of Svalbard. The Norwegian Geographical Survey (NGO) was invited to join the cruises and a fruitful cooperation was achieved. NP was responsible for geodetic measurements, triangulation, magnetism and tide measurements, while NGO concentrated on GPS (Global Positioning System) and gravity measurements. The combined use of the expedition ship, two helicopters and inflatable boats allowed for a fast and efficient moving of the seven teams involved in this work between the various stations around the archipelago.

Several other scientific disciplines were represented on board during both cruises. NP's biological programme included a comprehensive mapping and census of seabird colonies along the coasts and a general registration of fauna, especially polar bears, walrus, eider ducks, and geese. The registration of seabird colonies at Hopen was particularly successful owing to exceptionally clear weather which allowed both observation from inflatable boats and photographing from helicopter. About 170 polar bears were observed during the cruises. Several dead bears were also found; the cause of death was apparently starvation, due to the

lack of sea ice and accompanying seals. A total of 395 walrus was observed.

Oceanographic observations were carried out in cooperation with the University of Gothenburg as part of a programme attempting to determine the relative influence of the north Atlantic and the Arctic Ocean water masses around the Svalbard archipelago. In addition, studies were made on the effects of the local conditions in Svalbard (precipitation, ice melting and ice formation) on the oceanographic conditions in the adjoining sea areas.

Two automatic meteorological stations were set up on Kongsøya and Kvitøya during the cruises.

In cooperation with the Hydrographic Office of Norway and the Norwegian Coastguard, marine geological/geophysical and oceanographic investigations were carried out in the western Barents Sea. One upward-looking sonar was deployed in the Fram Strait and another in the Barents Sea to monitor the ice thickness and ice-keel frequencies. Two current metres were also deployed in the Barents Sea.

In cooperation with the University of Oslo, an extensive cataloguing of the geological coastal environment of Svalbard was continued by photographing and video filming of the northern and eastern coastline. Only a few localities now remain to be surveyed.

A general survey of certain historical remains was included in the second cruise.

2. Field work on land

Geology – Four of the Institute's eight geologists carried out field work in Svalbard, collecting data for the geological map series 1:100,000. Studies of the older folded and metamorphosed rocks were continued at Prins Karls Forland, Oscar II Land, and Brøggerhalvøya. Quarternary geology was studied at Forlandsundet and in Kongsfjorden. Basic geological studies were carried out concurrently with the mapping, and also by a special international group both on the north coast (Biscay-erhuken) and in Oscar II Land.

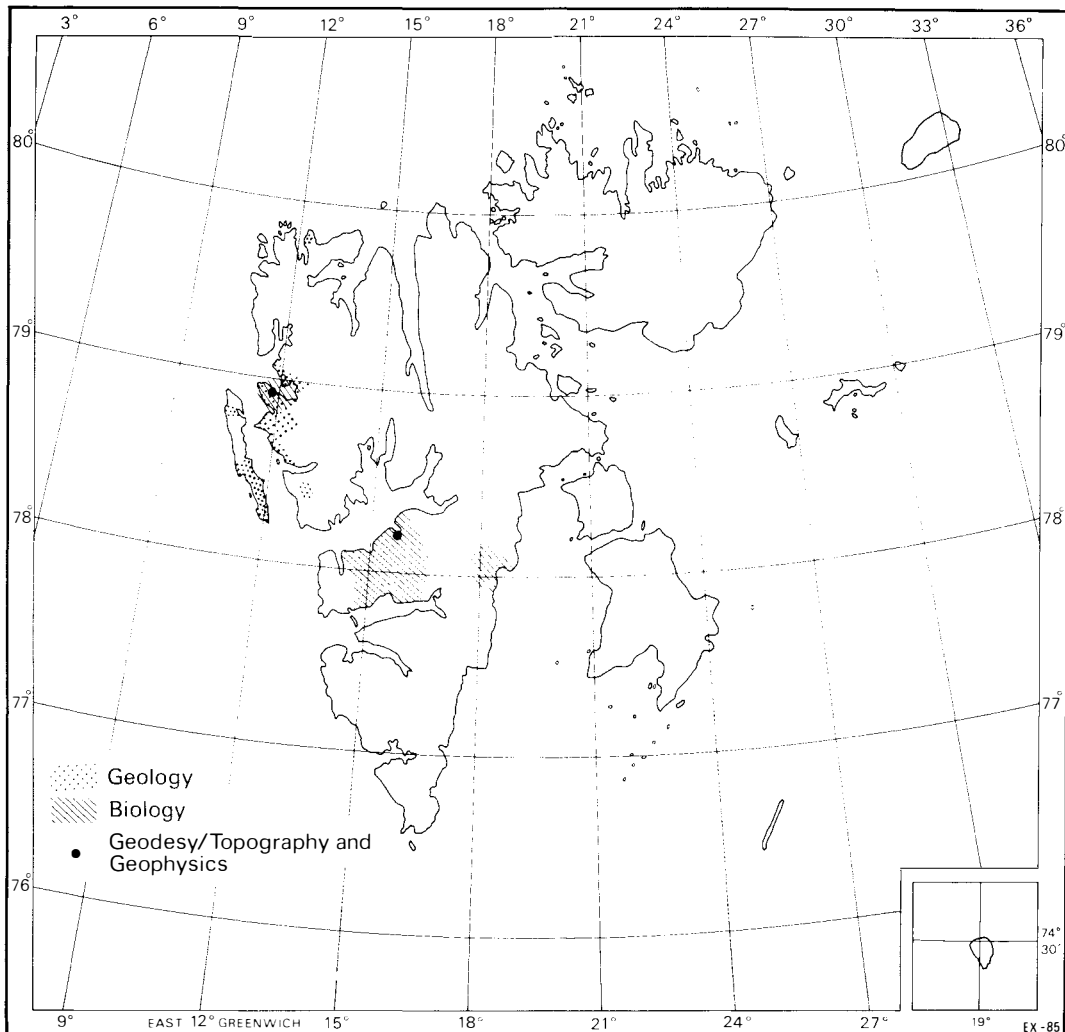


Fig. 2. Fieldwork areas on land in 1985 (not including work from LANCE).

Biology – The past few years' ornithological programme in the Ny-Ålesund area was continued with, in particular, detailed studies of eider duck colonies and seabird energetics. The seabird work included laboratory studies at the Research Station in Ny-Ålesund and field studies in Kongsfjorden. Reindeer population surveys including tagging and localization telemetry were conducted on Nordenskiöld Land and Brøggerhalvøya. The experimental reindeer harvesting programme was continued.

Geophysics – The long-term mass balance meas-

urements of the Austre Brøggerbreen and Midre Lovénbreen glaciers near Ny-Ålesund were continued. Both glaciers had negative balances. The mean thinning, since the measurements started in 1966, over the whole ice surface of Austre Brøggerbreen is 9.9 m, which is more than 10% of the total volume of the glacier. In cooperation with the Norwegian Meteorological Institute the automatic meteorological station on Kongsøya was replaced and a new station installed on Kvitøya. In Ny-Ålesund, the various components of short-wave and long-wave radiation were recorded

continuously as part of a long-term programme. The instruments were calibrated during the summer season.

Geodesy/topography – The staff of the division was occupied most of the season with topographical work on the two cruises. In addition, they gave the tide gauges at Ny-Ålesund and Longyearbyen their annual check.

B. Mainland Norway

Glaciology – Mass balance measurements of the Storbreen and Hardangerjøkulen glaciers were continued. This is a long-term project which for Storbreen involves the second-longest series of its kind. The aim is to observe any variation of the volume of the glaciers and to relate this to climatic factors. Accumulation on Hardangerjøkulen this year was about 75% of an average year, but ablation was also a little under normal so that the deficit was about -45

g/cm^2 . The same applied to Storbreen where the deficit was $-35 \text{ g}/\text{cm}^2$. Hardangerjøkulen was photographed at the end of August. The photographs will be used for mapping and the maps will then be used to check the balance measurements. The glacier was last mapped in 1962.

Measurements of the length fluctuation of ten glaciers showed that nine had retreated while Briksdalsbreen had advanced eight metres. The measurements give an approximate estimate of the glaciers' mass balance averaged over a longer period.

C. Antarctica

The Norwegian Antarctic Research Expedition (NARE) 1984/85 was the largest and most ambitious Antarctic expedition mounted by Norway in recent years. Norsk Polarinstitutt had the responsibility for the general organization and leadership. There were altogether 77

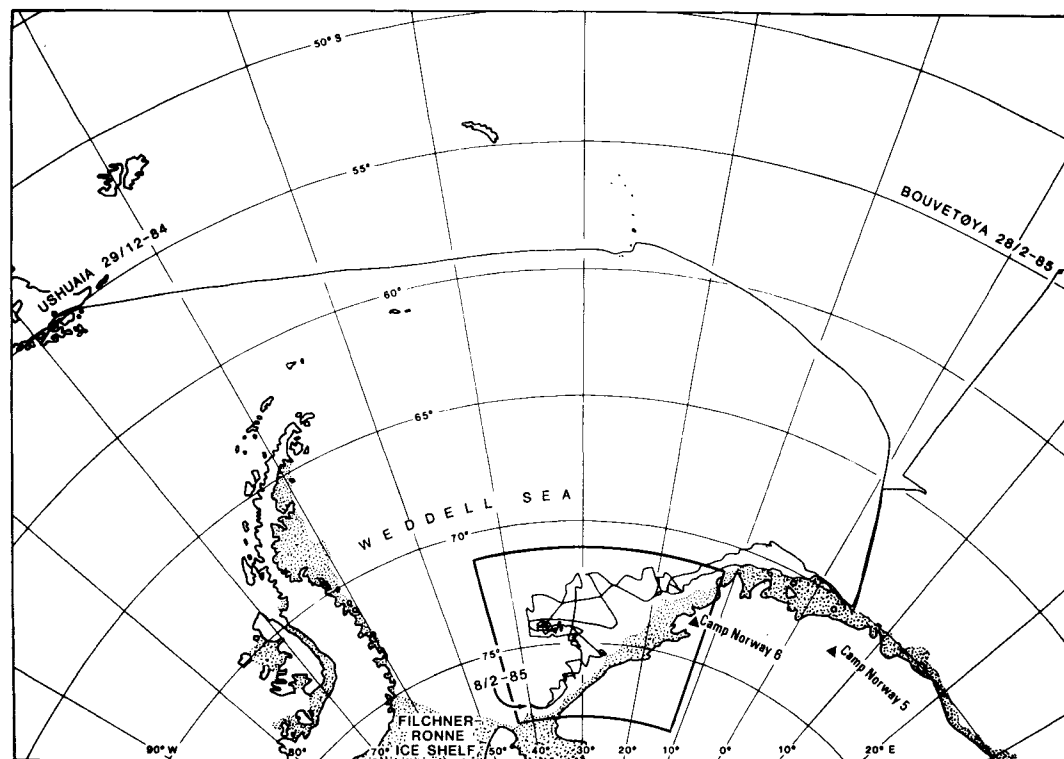


Fig. 3. Track of K/V ANDENES during the NARE 1984/85 expedition, from Ushuaia to Bouvetøya. Within frame: location of Fig. 4.

participants, including 28 scientists. The expedition lasted four months, two and a half months of which were spent in the Southern Ocean. The expedition vessel, K/V (Coast Guard Vessel) ANDENES, had sailed 26,000 nautical miles upon its return to Norway, and the main research had been conducted in the Weddell Sea area. The two hired Bell 206B (Jet Ranger) helicopters were stationed on board and clocked up 165 hours of flying time within Antarctica, including transport of personnel and equipment for distances up to 200 km from the ship.

The ship's complement consisted of 16 officers and 26 ratings, a smaller number than is usual owing to the absence of crew related to military operations. Four helicopter crew, two journalists, and an ice pilot were also on board.

The overall programme included the estab-

lishment of two summer stations in Dronning (Queen) Maud Land. Camp Norway 5, where ten scientists were based, was located by Svartthamaren in Mølig-Hofmannfjella at $71^{\circ}53'S$, $5^{\circ}10'E$ at an elevation of about 1600 m. Camp Norway 6, with five scientists, was located in Vestfjella, 120 km from the Barrier at 820 m elevation in position $73^{\circ}18'S$, $13^{\circ}55'W$. The remainder of the participants worked from the ship executing various scientific programmes during the one and a half months between deployment and retrieval of the land parties.

Figs. 3 and 4 show, respectively, the sailing route of the expedition, and the marine programme in the southern Weddell Sea during NARE 1984/85, together with the work of NARE 1976/77 and 1978/79.

Gjelsvikfjella and around Svartthamaren, including visits to 203 sites, and sampling at five

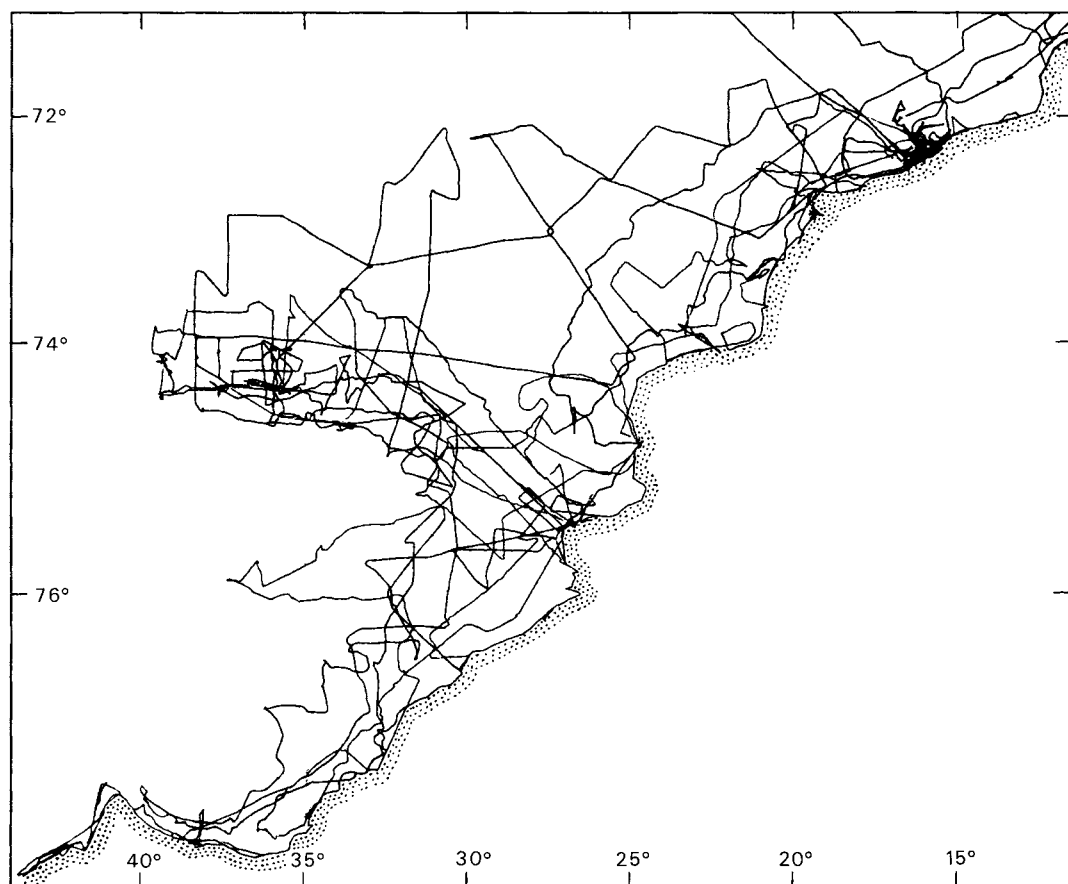


Fig. 4. Ship tracks of the NARE expeditions 1976/77, 1978/79 and 1984/85. The research conducted along these tracks includes bathymetry, magnetometry, gravimetry, multichannel seismics, high resolution seismics and side-scan sonar.



Fig. 5. Bouvetøya without a cloud cover – an extremely rare sight.

gy, geology, botany, invertebrates, meteorology, glaciology, paleomagnetism, marine geophysics and oceanography. More than half of the scientists had previous working experience from Antarctica, and practically all had been on other polar expeditions.

Results

The group at Camp Norway 5 did ornithological studies of the Antarctic Petrel colony of nearly one million individuals at Svarthamaren including investigations into energetics, thermoregulation, behaviour, census and ringing. Collembola and mites, mainly from the Svarthamaren area, were also investigated, and vegetation recorded at 54 sites. The topographers positioned six points by satellite, and another eight by triangulation, and surveyed a network along 150 km of the mountain range. Regional geological mapping was done in Gjelsvikfjella and around Svarthamaren, includ-

ing visits to 203 sites, and sampling at five localities for age determinations. Snow samples for geochemical studies were collected at more than ten sites, and various meteorological studies were conducted in connection with the biological and glaciological studies.

The group in Vestfjella collected geological and paleomagnetic samples at respectively 24 and 82 sites, and conducted sedimentologic and glacial geologic studies at a number of locations. They also measured over 200 km of magnetic profiles, and collected vegetation samples at ten sites. The Camp Norway 5 and 6 parties travelled about 12,000 km with their skidoos, with the longest distances covered by the topography and geology parties each amounting to nearly 2000 km.

The data acquired in the ship-borne research programme include the collection of nearly 3000 km of multichannel seismic data, 1500 km of sparker data, 100 km of sea bed side-scan data, continuous penetrating echo sounder

data, nearly continuous magnetometry data, and marine gravimetry during the first half of the cruise. Sea bed samples were collected at 18 sites, and photographs taken of the bottom at 14 sites. Hydrographic (CTD) observations were made at 87 sites, and 9 rigs were deployed with altogether 19 current meters, one water level recorder, and a thermistor chain. Two sophisticated iceberg experiments were conducted, and over 100 km of side-scan sonograms collected showing underwater shapes of ice fronts and icebergs. Sea ice samples were collected at ten localities.

Work at Bouvetøya included obtainment of the first cloud-free mapping photography of the upper part of the island, completion of a survey network initiated in 1978, re-census of the penguin and seal colonies, and collection of vegetation and geological samples from locations not previously visited.

The helicopters were used for airborne magnetometry studies over Riiser-Larsenisen, and radio echo soundings of ice thicknesses here and over Trolltunga. In addition, the helicopters provided logistic support to the land parties and to the iceberg study groups, and were also employed in sea ice reconnaissance. Altogether about 300 flights were made during the expedition.

More detailed reports of the above mentioned investigations and the preliminary results are presented in Norsk Polarinstitutt Report No. 22, Report of the Norwegian Antarctic Research Expedition 1984/1985, published in 1985.

Section Reports

Biology

Norsk Polarinstitutt is responsible for management-orientated biological research in the Norwegian polar areas. The work of the biologists incorporates ecological mapping and population biology studies within the categories marine biology (excluding the Directorate

of Fisheries' area of responsibility), ornithology, botany and land mammals. The division has two tenured biologists. In addition, two ornithologists were contracted in 1985, one under the Pro Mare marine ecology programme and one financed by Institute funds. All four biologists carried out field work in Svalbard. One ornithologist took part in the NARE 84/85 expedition studying breeding ecology of seabirds in Dronning Maud Land.

Updating of the Institute's data base for fauna observations was done by a contracted zoologist. Studies of the Svalbard reindeer and the Svalbard ptarmigan were continued. A compilation of results of polar bear studies over many years was presented as a Dr. philos. thesis.

Geology

The geology division employs eight geologists - six working with terrestrial geology and two with studies in the Barents Sea - and a technician. The following research fields are represented: older metamorphic and folded rocks (2), younger sedimentary sequences (2), coal petrography (1), quaternary geology (1), and marine geology (2). In addition to doing basic geological research, the division has concentrated its efforts towards the production of geological maps of Svalbard to various scales.

One geologist (Harald Major) retired in 1985. The vacancy has not yet been filled. One geologist was granted one year's leave from May and a substitute was engaged from August. Two geologists took part in the NARE 84/85 expedition and four undertook field studies in Svalbard.

Work continued on the geological map series of Svalbard to the scale of 1:100,000. A geological map of Svalbard and Jan Mayen to the scale of 1:1,000,000 for publication in the National Atlas of Norway (to be published by the Geographical Survey of Norway - NGO) is near completion. Material collected in Svalbard, the Barents Sea, and in Antarctica has been studied and results presented in publications and lectures.



Fig. 6. Demonstration of ice-cored moraine on Uversøya, Engelsbukta. The ice-core has become visible in the lower part of the section. The moraine was formed during the last glacial advance a few hundred years ago.

Geophysics

The Institute's five geophysicists are specialized in the areas meteorology (1), sea ice research (1), glaciology (2), and oceanography (1). One of the glaciologists is responsible for the planning and organization of the Institute's Antarctic research, and was leader of the Norwegian Antarctic Research Expedition 1984/85 during the first three months of the year. The other four geophysicists worked in and around Svalbard during the field season. The main activity of the geophysical division is long-term studies of different aspects of the climatic conditions, with special emphasis on ice research.

Meteorological observations from the automatic stations in Svalbard were examined, and the preparation of the data for a regional climatological analysis continued. Norsk Polarinstitutt, the Norwegian Meteorological Institute, and the Polar Science Center, Seattle, contin-

ued cooperative investigations of the interaction of ice drift, wind and ocean currents in the Transpolar Ice Drift Stream, the Fram Strait and the Greenland Sea. Three ice-drift stations were deployed near the North Pole.

Sea-ice investigations based on satellite imagery, automatic buoys, and measurements conducted from ships were continued. Data for the last ten years concerning the distribution and frequency of fast ice and the frequency and size of winter-open areas near land in the Svalbard archipelago have now been digitized and transferred to maps.

Oceanographical data and sea-ice observations from three summer cruises were prepared for publication.

The processing of iceberg data from Antarctica, collected through an international programme led by the Institute, was continued. Information has now been collected on more than 70,000 icebergs.



Fig. 7. Geodetic/topographic work was given priority on this year's scientific cruises.

Geodesy/topography

Norsk Polarinstitutt is responsible for the land mapping of the Norwegian polar areas and for producing map series of these areas. Three topographers and a geodesist are employed in this work. Two of them participated in the NARE 1984/85 expedition and were primarily concerned with satellite positioning work and triangulation measurements. Clear weather over Bouvetøya enabled aerial photographs to be taken for mapping purposes. One topographer carried out triangulation work on Storbreen in Jotunheimen in the spring, as part of the Institute's glaciological programme. The division's staff of four participated on both scientific cruises to Svalbard in the summer, one topographer as cruise leader.

The division has worked on three maps in the Svalbard 1:100,000 series: C7 Dicksonfjorden, G3 Leighbreen, and G4 Isispynten, and Bouvetøya 1:20,000 was completed. In addition, several maps listed under *Publications* were published. Digitalization of maps in the

Svalbard 1:100,000 series was carried out and a computer programme for analysis of tide measurements was made operative.

Cartography

The cartographical division's main activity is the technical preparation and production of all the Institute's topographical, geological and glacier maps, and the administration of the final preparation and map printing work which is done outside the Institute. Three cartographers and an illustrator are occupied with this as well as with illustrating work for the Institute's publications.

In addition to publishing the maps listed under *Publications*, the division has this year been concerned with the preparation or revision of eleven topographic maps of Svalbard, all in the main 1:100,000 series, eight geological maps of Svalbard and the western Barents Sea (of which B10G Van Mijenfjorden is in the main series), and a 1:20,000 topographic map

of Bouvetøya. The division is also undertaking work transferring the place-name card file to a computer data base.

The Place-name Committee

The Place-name Committee works with the assignment of geographical place names in the Norwegian polar areas. It approved fifteen new names in 1985, of which nine are in Svalbard, two in Dronning Maud Land, and four on Bouvetøya.

Computer section

Hardware – Last year the Institute experienced a dramatic expansion of the computing capacity. The single ND-100 was slowing down due to the great number of users. In January a new ND-530 was installed. This resulted in a marked improvement in response time for the users, and also made traditional programming easier: a 32-bit computer is better able to cope with large programmes than the 16-bit machines.

During the year it became obvious that we would go short of disc storage capacity. A 450 MB disc drive was therefore connected to the ND-530. The total storage capacity for the system has thereby reached 600 MB.

Software – Each division is responsible for its own data collecting and creation of data bases. The computing section is responsible for hardware and the necessary software. During 1985 a great deal of resources and efforts were expended on practical assistance and advice by the section to the staff. Effort has also been spent on the development and improvement of software.

Information/documentation

An information officer, a publications editor, a librarian, a translator and a part-time assistant try to cover the multitude of documentation tasks resulting from the Institute's responsibility for the scientific research in the Norwegian

polar areas. An upsurge of interest in polar matters has been noticeable for all aspects of the division's work.

The Institute receives a great many requests for general information concerning the polar areas. The staff contribute with scientific and popular lectures, articles and interviews for newspapers and magazines as well as material to and participation in radio and television programmes. A small exhibition presenting the Institute was produced in 1985 and work was started on a special exhibition concerning Norwegian polar explorers for the World Fair EXPO-86 to be held in Vancouver in 1986. The information officer was consultant during the production of an information film about the arctic island of Jan Mayen. The Institute was also involved in a general *Course on Svalbard* held over two weeks in Ny-Ålesund, Spitsbergen, by the KOMMIT group at the University of Trondheim.

Several refereed series are published by the Institute, describing results of scientific and other activities in Norwegian polar regions. Manuscripts are received from Norwegian and foreign scientists, as well as from the Institute's own staff. Publications in 1985 are listed on page 30. NP exchanges its publications with those of other scientific institutions and libraries in 26 countries spread over five continents.

The library has a good selection of old and new material on polar subjects and is open to the public in office hours. In the course of the year 279 new titles were registered. The reprint collection now comprises approximately 6550 items.

The translator is mainly occupied with the translation from Russian to English of scientific literature of interest to the Institute's staff. A list of the translations carried out this year is to be found on pages 32–35.

Logistics

1985 was one of the busiest years in the experience of the division. It has five permanent posts and a number of occasional part-time helpers, but the personnel situation was unstable in 1985 owing to illness and leave.



Fig. 8. The helicopter based in Ny-Ålesund provided good support for the geological parties working nearby.



Fig. 9. A rendezvous for discussions: LANCE and the Sysselmann's ship POLARSTAR.

Through the use of a rota system, the division always has an on-the-spot representative in charge of the equipment at the research station in Ny-Ålesund. One man participated in the NARE 1984/85 expedition, and the division was involved in the unloading and care of the equipment upon return to Norway.

The problem of satisfactory storage and work space for the division was temporarily solved by the renting of an 830 m² hall 11 kilometres from the main office. Installation and moving work will keep the division occupied well into 1986.

Responsibility for navigation beacons

Norsk Polarinstitutt has, since 1933, had the practical responsibility for establishing and maintaining a network of navigation lights and beacons (including 42 signalling beacons) for ships and aircraft on Spitsbergen. Personnel from the logistics division are responsible for their annual inspection and service.

The 1985 season was a very active one as many new installations were commissioned. Passive radar reflectors were set up at Kvadehuken, Bellsund, Daudmannsodden and Sars-tangen, and navigation lights for aircraft were set up near Hornsund and at Kvadehuken and Daudmannsodden. A radar beacon and navigation light with a service hut and a small wind generator were established on Sørkappøya and a new radio beacon was installed at Fuglehuken. General service of other lights and beacons was carried out.

Norsk Polarinstitutt's Svalbard office, Longyearbyen

The Institute has had a base for its Svalbard expeditions in Longyearbyen since 1977. The logistics division is responsible for the service function of this office, both for the Institute's own people and for other visiting scientists. The office is manned during the entire field season on land which in 1985 stretched from June to September. A 70 m² heated garage was established in one of the airport hangars.

Norsk Polarinstitutt's Research Station, Ny-Ålesund

The Research Station in Ny-Ålesund was established in 1968 and is one of the most northerly land stations in the world. It serves as an observatory, a laboratory and a field base and is available all year round for Norwegian scientists and others working with arctic problems in cooperation with Norwegian scientific institutions.

The station's function of observatory provides the most important part of the activity there, with a considerable recording of mainly geophysical data. The recording instruments at the seismic station were modernised in the autumn of 1985 enabling tremors to be registered on tape and be printed out for quick-look inspection.

The regular helicopter flights between Longyearbyen and Ny-Ålesund once a fortnight throughout the year are of great importance to the station. During the summer the service is doubled to weekly flights. Visiting scientists with approved projects can apply for free transport as far as seats and baggage capacity allow.

A number of scientific projects are carried out at the Research Station. The following phenomena are recorded continually or observed during longer periods of the year.

Components of the radiation energy

budget	- Norsk Polarinstitutt
Tide measurements	- Norsk Polarinstitutt
Mass balance of glaciers	- Norsk Polarinstitutt
Atmospheric pollution	- NILU
Meteorological conditions	- DNMI
Seismic disturbances	- University of Bergen
The Earth's magnetic field	- Universities of Tromsø and Oslo
Ionospheric activity, including aurora	- Universities of Tromsø and Oslo

During the course of 1985, 52 persons stayed at the station for a total of 999 visitor days. Such visits are unfortunately not evenly spread throughout the year; two-thirds of the visits occurred in the period 20 June - 8 August. 58% of the visits were concerned with biological programmes, 29% with geophysical programmes,

and 12% with Quarternary geology. A great number of other visitors have worked in other parts of Svalbard, but have made short stops in Ny-Ålesund.

The Institute's research fellow in Ny-Ålesund was appointed in May. Research on

the *Ecology and population dynamics of the Svalbard ptarmigan* project had been started by Sigmund Unander in 1980. He continued this project in 1985 as research fellow, dividing his time between the research station and the biology division at the main office.

Scientific Projects in 1985

Biology

Ecological polar bear studies

Fauna data base

Seabird studies in the Svalbard area (including the *Pro Mare* project: Seabird ecology in the Arctic)

Studies of population and breeding biology of eider duck in Svalbard

Population ecology of Svalbard ptarmigan

Ornithological studies in Dronning Maud Land

Reindeer studies in Svalbard

Thor Larsen

Fridtjof Mehlum

Fridtjof Mehlum

Geir W. Gabrielsen

Fridtjof Mehlum

Sigmund Unander

Fridtjof Mehlum

Nils Are Øritsland

Geology

Regional geological investigations in Svalbard

Audun Hjelle

Yoshihide Ohta

Otto Salvigsen

Thore S. Winsnes

Audun Hjelle

Yoshihide Ohta

Thore S. Winsnes

Hilde B. Keilen

Yoshihide Ohta

Otto Salvigsen

Anders Elverhøi

Anders Solheim

Anders Elverhøi

Anders Solheim

Hilde Keilen

Tore Gjelsvik

Yoshihide Ohta

Anders Elverhøi

Anders Solheim

Correlation of older complexes

Dating of older metamorphic rocks

Glaciation and deglaciation of Svalbard

Investigation of unconsolidated sea floor in the Barents Sea

Studies of upper bedrock geology (subcrop) in the Barents Sea

Study of the Devonian sequences of Svalbard

Regional investigations in Dronning Maud Land, Antarctica

Sea-floor investigations in Antarctica

Geophysics

Mass balance studies of the glaciers Storbreen and Hardangerjøkulen

Olav Liestøl

Olav Liestøl

Olav Liestøl

Vidar Hisdal

Mass balance studies of glaciers in Svalbard

Length measurements of glaciers in Norway

Climatological description of the Svalbard area

Radiation measurements in Ny-Ålesund

Arctic Ocean Buoy Programme

Sea ice studies in areas around Svalbard

Automatic meteorological station on Bouvetøya

Oceanography of sea areas around Svalbard

Studies of tabular icebergs in Antarctica

Vidar Hisdal

Torgny Vinje

Torgny Vinje

Torgny Vinje

Torgny Vinje

Bert Rudels

Olav Orheim

Topicalities

Data bases for the Norwegian polar areas

One of the Institute's important functions has always been the collection, storage and presentation of information about the Norwegian polar areas. Although Norsk Polarinstitutt is not alone in this function, it has the special responsibility for continuity and for covering a wide range of fields in its data collection and storage. The multi-disciplinary nature of the Institute itself gives added value to the presentation of the many different types of data.

As part of its central institute status Norsk Polarinstitutt also has a similar data storing and presentation function within areas not covered by own activity where these areas are not naturally covered by another government institution on a permanent basis.

The use of computers for storing and organizing large data masses has greatly assisted the Institute's work. The building up of data bases for the Norwegian polar areas has therefore been given priority this last year and short presentations of some of the bases are given below. However, the storing in different data bases has reached varying stages and none of them are, as yet, available for external searching. Due to the lack of necessary resources this work unfortunately cannot progress as quickly as we would have hoped.

Fauna data base (Fridtjof Mehlum)

Norsk Polarinstitutt has collected and systematized observations of Svalbard's birds and mammals since the early 1960s. The data were gathered by the Institute's own staff, by weather station crew, inhabitants of Svalbard, participants on other expeditions, and other sources. In 1962, observations were published in the Institute's *Årbok* under the title *Observations of the animal life in Svalbard*. However, with a steadily increasing activity on the archipelago the material gradually became overwhelmingly large and annual publication of the observations became impractical. The Institute therefore elected to make use of data technology. Potential observers were given standard forms to be completed and returned to the biological division on return from Svalbard. Information from the forms was subsequently coded and entered into the computer. At the same time a great deal more observations of fauna at sea were recorded. During the scientific cruises in the Barents Sea and the Fram Strait the bridge was continually manned with observers, noting bird and animal life. Concurrent observations were made of visibility, weather and ice conditions, and other parametres, which were also coded for computer processing.

The Institute's fauna data base comprises today many thousand observations. The records of seabirds at sea have made it possible to produce maps which show relative occurrences of different species. Observations of marine mammals have made it possible to produce maps of their distribution. In addition, the data base for mammals used in conjunction with the calculated efficient observation distance from the ship, provides estimates of the number of animals per unit of area. The data base can also be used in population biology studies; e.g. the Institute has at the present time almost 5000 polar bear observations registered in the data base. The observations distinguish between adults and young animals and give information about the average litter size at different times of the year. The use of appropriate computer programmes enables us to calculate e.g. the mortality rates of young polar bears in Svalbard.

The data base should eventually be available for use in long-term monitoring programmes, to

follow the changes in species abundancies for instance in bird cliffs, or in the distribution of different species. The data base can be used for evaluating the environmental consequences of possible industrial activity in certain areas, or when an immediate evaluation is needed of the possible effects of, for example, an oil slick drifting towards the coast of Svalbard. Because the data base is an important tool in the work of the wildlife managing authorities, the Institute will continue to give priority to computer registrations.

Bathymetric data base for the Barents Sea (Anders Solheim)

Considering the demands of modern bathymetric mapping, the data coverage in the Barents Sea is variable. A considerable amount of information from different surveys exists that combined give a regional outline of the Barents Sea bathymetry. A major effort has been undertaken at Norsk Polarinstitutt during the last few years in compiling all these data to build up a regional data base covering the entire Barents Sea, and to use the data base in map production. The project was initiated and led by Professor Yngve Kristoffersen (now at The Seismological Observatory, University of Bergen), and the data processing was performed by Morten Sand (now at the Norwegian Petroleum Directorate (NPD)).

The data sources are NP hydrographic surveys 1963-1983 and NP scientific cruises 1980-1983, NPD seismic cruises 1974-1981, Norwegian Directorate of Fisheries, Institute of Marine Research cruises 1974-1976, Lamont-Doherty Geological Observatory scientific cruises 1965-1975, and Norwegian Oceanographic Datacentre and Soviet fishery charts. The NP hydrographic surveys were navigated by means of Hi-Fix or Sea-Fix systems. The other surveys had a more regional character and used satellite navigation, integrated with DECCA and LORAN C. The spacing between data points may vary considerably between different surveys, from 400-3200 metres in the NP hydrographic surveys, to 7-10 kilometres in the seismic surveys.

All data have been contoured at 20 m (down to 500 m) and 100 m (below 500 m) contour intervals, at scales of 1:100,000 and 1:200,000. All contours were digitized to form the complete data base. The following three map sheets have been produced from this data base and can be purchased at Norsk Polarinstitutt:

3-dimensional map of the entire Barents Sea, final drawing by M.Adachi, 3-D Drawing A/S
2 sheets 1:500,000, covering the area 72° N - 74° N, 9° E - 33° E

The following sheets are under preparation:

2 sheets, 1:500,000, covering the area 74° N - 76° N, 9° E - 33° E
2 sheets, 1:1,500,000, covering the entire Barents Sea (will be published as a part of *Norsk Polarinstitutt Skrifter 179*).

The data base will be transferred to and be included in the regional data base of the Norwegian Hydrographic Survey.

Bibliographic data base (Reidunn Lund)

In 1985 the first steps were taken towards entering the computer age in Norsk Polarinstitutt's library. As a starting point we chose to enter all new accessions and a selected group of older material on to computer files. The data base is planned to contain scientific literature about the Norwegian polar areas, including special collections such as trappers' diaries, articles, etc. Event-

ually it will encompass all types of bibliographic material, but we expect it will take some years before the Institute's entire collection is data registered.

To meet the different requirements from the Institute's various sections, we chose the POLYDOC registration system, developed by Norsk Senter for Informatikk. The POLYDOC system is flexible enough to take the information needed for each single entry, and has the advantage that the customer may search for information from any angle. With future library data collaboration in view, we adapted the standard entry form for the registration of literature, also developed by Norsk Senter for Informatikk. Only a few adaptations were necessary.

The first group of literature registered on data was the library's collection of diaries. This work is nearly completed, only a few adjustments remain. With the assistance of a student from the Norwegian College of Librarianship, registration of purchased books was started, beginning with the year 1985 and going backwards in time. So far we have reached the year 1979.

Data base for icebergs in the Southern Ocean (Olav Orheim)

Relatively few data on the distribution of Antarctic icebergs were available prior to 1980. The published literature included size data of about 5000 icebergs, and position data of 12,000 bergs. There were indications that the size data were biased in favour of larger bergs. In 1981, therefore, Norsk Polarinstitutt initiated a programme of systematic iceberg observations, using standard forms distributed to all ships going to Antarctica. The icebergs are recorded every six hours and in five length groups, 10-50 m, 50-200 m, 200-500 m, 500-1000 m, and those over 1000 m long are described individually. The amount of data has increased greatly from the start in 1981/82. The position of 70,000 icebergs, including 50,000 that had been size classified, were on file at Norsk Polarinstitutt by December 1985, and the data set is growing rapidly.

The 'standard size' (length, width, thickness) is based on observations from three Antarctic expeditions dedicated to iceberg studies. Many icebergs are, of course, not right-angled parallelepiped in shape, but this is a good approximation for most of the larger bergs.

The data are based on both visual sightings and radar observations. Duplicate observations from a ship moving at slow speed or which is stationary are as far as possible eliminated, both during observation and by critical appraisal before the data are filed. The data editing also includes the comparison of positions and dimensions of the large bergs in order to reduce to a minimum repeated observations from different vessels of icebergs smaller than 1000 m which account for most of the iceberg mass.

Information on the data base is available for external users and data have been provided on request for various research purposes. Maps and print-outs of data are automatically returned to all contributors.

Data base for geological samples from the Arctic region (Hilde B. Keilen)

During the last ten years efforts have been made to establish a data base for geological samples from the Svalbard region. This work was initiated by Dr. David Worsley at the Paleontological Museum in Oslo, who concentrated on the sedimentary fossiliferous rocks. Some samples from other polar regions, e.g. Ellesmere Land, Novaja Zemlja, Frans Josef Land, and Antarctica were also included. The data base is intended to be a helpful tool for geologists who require knowledge of what kind of samples have been collected from where, who the collector is, where the samples are kept, and the names of those who have described them. The registrations have been completed for samples collected prior to 1980, and work in progress now at Norsk Polarinstitutt provide

updated information up to 1985. Eventually it will be possible to sort out and list different kinds of information according to the defined keywords, but the data base is not yet available for external users.

Geology data base (Audun Hjelle)

Two of the Institute's geologists took part in a pilot project for the use of light, portable PCs in the geological work in Svalbard in the summer of 1985. The data input system used was highly flexible; the field data, involving lithology, structure, stratigraphy, location coordinates, etc. were included in the ordinary text of field notes. Subsequent retrieval of data was made possible by the 'marking' of key words accompanying each kind of data. Back in the office, the field data were transferred from the PC-discs to the main office computer. Further processing of the data involves use of the GEOPLOT programme, which has facilities for producing plots of maps and diagrams, lists, tables, etc.

Place-name data base (Bjørn Arnesen/Olav Liestøl)

Norsk Polarinstitutt's internal Place-name Committee started discussions in 1982 concerning the use of computer techniques in the registration of place-names in the Norwegian polar areas. Contact was established with the Institute for Name Research at the University of Oslo in order to take advantage of their experience with similar work. In April 1985 the guide-lines for the data base were finally decided in close cooperation with the Institute's computer section. The Polydoc registration programme was chosen as it serves the needs of both the place-name data base, the library and the photo archive. A test programme of 176 names was carried out during the summer. The writing of *NP Skrifter No. 80 The Place Names of Svalbard* was begun in October with help from the University of Oslo.

Approximately 9000 place names with accompanying information have to be entered into the data base. The Institute for Name Research plans to start a research project concerning place names in the Norwegian polar areas in autumn 1986 and a cooperation on data base registration with this institution is therefore anticipated.

Sea-ice observations, Arctic (Torgny Vinje)

Sea ice observations under an American project known as 'Birds Eye', were obtained from aircraft over the western Arctic in 1962-1971. Using these observations, Norsk Polarinstitutt has now compiled detailed characteristics of the ice fields at different periods of the year on tape. Copies of the tapes may be ordered from the Institute.

Sea-ice distribution between Greenland and Novaja Zemlja (Torgny Vinje)

Ice charts based on data from satellite borne advanced high resolution radiometers (AVHRR) with one kilometre resolution are digitized for the period 1976-1985. A data base is under development.

‘Ice Drift Experiment’ (ICEX) buoy data (Torgny Vinje)

Noon values of positions, air pressure, and air and ice temperatures have been collected on tape since 1976 for the ICEX and ICEXAIR projects. Data on corresponding geostrophic wind components for selected periods have been edited and can be sent on request.

Historical sea-ice observations (Torgny Vinje)

A data base containing sea ice observations since the year 1600 in the Greenland, Svalbard and the Barents Sea region is under development.

Tabular iceberg drifts, Antarctica (Torgny Vinje)

A data base is under development on the daily positions of 13 tabular icebergs for various periods from 1978 to 1980.

Radiation data (Vidar Hisdal and Torgny Vinje)

A data base containing the main short-wave and long-wave radiation components registered at Ny-Ålesund from 1976 to 1985 is under development.

Meteorological observations, Antarctica (Vidar Hisdal)

Meteorological observations made at Maudheim from 1949 to 1950, at Norway Station from 1957 to 1959, and for various periods at Bouvetøya from 1977 to 1985 are now registered on tape and may be sent on request.

Maps for the National Atlas of Norway – to be published by the Geographical Survey of Norway (NGO)

Maps of the Norwegian polar areas have a natural place in a National Atlas of Norway. Norsk Polarinstitutt has contributed towards achieving this coverage in active cooperation with the Atlas’ direction and other scientific institutions.

Norsk Polarinstitutt is responsible for the topographic and thematic mapping as well as mapping of the upper layers of the sea floor in the Norwegian polar areas. The basic data needed for producing satisfactory thematic maps varies for the different scientific fields, according to the scientific expertise and material present at the Institute. It has been necessary to engage external specialists and to organize the work in well-defined mapping projects for those scientific areas which the Institute does not cover or where it lacks the capacity. There is a very positive cooperation between the Institute and the direction of the National Atlas and the other persons and institutions involved.

The following results were obtained in 1985:

Geological map of Svalbard and Jan Mayen 1:1, 000,000

Geologist Thore S. Winsnes has been responsible for this map which will be published in 1986.

Glaciological map of Svalbard 1:1,000,000

The contact person at the Institute has been geologist Otto Salvigsen, while Professor Johan Ludvig Sollid, Geographic Institute, University of Oslo, has been the scientist responsible for the project. The map is expected to be ready for printing in March 1986.

Vegetation map of Svalbard

The work with this map started at the beginning of the year with biologist Ingvar Brattbakk as project leader. At this time Brattbakk was administratively attached to the Institute through the MAB/Svalbard project, but was based at the DKNVS Museum in Trondheim.

Environmental impact studies

The oil companies' increasing interest in searching for hydrocarbons in the Barents Sea and Svalbard has actualized the need for environmental impact studies in these areas.

It is the intention of the Ministry of Oil and Energy to open the oil field *Barentshavet Syd* in 1989 (the Norwegian part of the Barents Sea north to Bjørnøya). The Soviet mining company Trust Arktikugol has already started drilling in Svalbard. Various Norwegian, English and American companies did seismological work on the archipelago in 1985 and will continue to do so in 1986, planning to start drilling in 1987 or 1988.

The Ministry started a three-year programme in 1985 concerning environmental and socio-economical consequences of the oil industry in the Barents Sea. Norsk Polarinstitut will take part in this programme, together with other Norwegian institutions. The Institute will work mainly with seabirds, sea mammals, oceanography and sea-ice.

The Ministry of the Environment is responsible for impact studies in Svalbard. On its behalf, Norsk Polarinstitut will coordinate and lead a project called *Environmental studies in Svalbard in connection with petroleum activity*, which will be a three-to-four year study, starting in 1986.

The scientific staff of the Institute will be expanded during the coming years to meet the new tasks regarding environmental impact studies in Svalbard and in the Barents Sea. A new position was established in 1985 to prepare for future activities.

International cooperation

The Norwegian Polar Research Institute is the national central institution for research in Norwegian polar areas. Foreign scientists usually contact the Institute for scientific and practical information before starting their work in Norwegian polar regions and they are often also looking for cooperative partners. Polar science is represented at all the Norwegian universities as well as at some other scientific institutions. Cooperative projects, therefore, are partly involved with the staff of our Institute and partly with other Norwegian scientists.

Norsk Polarinstitut's research station in Ny-Ålesund is also open to foreign scientists cooperating with Norwegian scientists.

In 1985 the Institute participated in cooperative projects within the fields of sea-ice research, geology, oceanography and biology with scientists from France, Poland, Sweden, West Germany and USA.

National Level

The Institute and its director (as chairman of the Norwegian National Committee on Polar Research) are also involved in international cooperation at a national level. During 1985 several new possibilities were explored in 1985:

USSR – A small group headed by the Institute's director was invited by the State Committee for Science and Technology 21-28 March to start discussions concerning possible bilateral cooperation in arctic research. The discussions were positive and it was agreed to continue at the end of the year in Oslo. For practical reasons this last meeting was postponed until the beginning of 1986.

Poland – There is a mutual interest for extending the polar scientific cooperation between Norway and Poland. Several contacts have been made and some cooperation has started. An agreement for cooperation on ecological, environmental and geodynamic studies at the Polish station in Hornsund was discussed in Warsaw in April and signed in Oslo in May by the Institute of Geophysics, Polish Academy of Sciences, and Norsk Polarinstitutt. The agreement calls for cooperative projects open to scientists from both countries. Interested scientists may contact these institutions for more information.

France – French/Norwegian cooperation has been expanded during the last years and it was suggested that polar research should also be included. A letter of intent between the Institute and CNRS (Centre National de la Recherche Scientifique) already exists, but few projects have materialized. The French minister of science visited Oslo in June and a meeting was organized at the Institute during which four cooperative projects were agreed upon within the fields of glaciology, geology, upper atmosphere physics, and remote sensing.

European Science Foundation (ESF) – ESF together with Norsk Polarinstitutt and the Norwegian Research Council for Science and the Humanities hosted a European workshop in November. The intention was to discuss the need for scientific networks in the various fields of polar research. The response was positive and the organization of a network will be discussed further by ESF.

Published in 1985

Several series are published by the Institute. The journal *Polar Research* contains shorter original scientific papers in English and appears in two-three issues per year. The *Skrifter* series is for monographs in English, French or German, while *Meddelelser* is a series for articles of a more popular character. *Polarhåndbok* has so far appeared in two issues, on the flora and geography of Svalbard. *Årbok* has been published annually since 1960. A new series, *Temakart* (Thematic maps), was started this year.

Norsk Polarinstitutt's publications may be ordered from the Institute, from bookstores or directly from the following agents:

Universitetsforlaget
Box 2977 Tøyen
N-0608 Oslo 6, Norway

Global Book Resources Ltd.
109 Great Russell Street
London WC1B 3NA, England

Columbia University Press
136 South Broadway
Irvington-on-Hudson
NY 10533, USA

Publications in 1985

Polar Research

This journal, started in 1982, is now well established. It is exchanged with the scientific literature of about 250 institutions around the world and is indexed in *Current Contents*. Two issues appeared in 1985:

Vol. 3 n.s., No. 1

Landvik, Jon Y. and Salvigsen, Otto: Glaciation development and interstadial sea-level

on central Spitsbergen, Svalbard.

Solheim, Anders and Elverhøi, Anders: A pockmark field in the Central Barents Sea; gas from a petrogenic source?

Nøttvedt, Arvid: Askeladden Delta Sequence (Palaeocene) on Spitsbergen-sedimentation and controls on delta formation.

Ohta, Yoshihide: Geochemistry of precambrian basic igneous rocks between St. Jonsfjorden and Isfjorden, central western Spitsbergen, Svalbard.

Ohta, Yoshihide: Geochemistry of the late Proterozoic Kapp Hansteen igneous rocks of Nordaustlandet, Svalbard.

Ague, Jay James and Morris, Alan Paul: Metamorphism of the Müllerneset Formation. St. Jonsfjorden, Svalbard.

Ricketts, B., Osadetz, K. G. and Embry, A. F.: Volcanic style in the Strand Fiord Formation (Upper Cretaceous). Axel Heiberg Island, Canadian Arctic Archipelago.

Research Notes

Øritsland, Nils Are: Comments to a polar bear population model.

Parker, Howard, Ottesen, Harald and Knudsen, Edgar: Age determination in Svalbard ptarmigan *Lagopus mutus hyperboreus*.

Dunin-Kwinta, Izabella and Rozycki, Olgierd: The Arctic Skua *Stercorarius parasiticus* L. in northwest Hornsund, Spitsbergen, summer of 1980.

NOK 80,-

Vol. 3 n.s. No. 2

Anda, Einar, Orheim, Olav and Mangerud, Jan: Late Holocene glacier variations and climate at Jan Mayen.

Ratkje, Signe Kjelstrup: Temperature gradient snow metamorphosis.

- Salvigsen, Otto and Elgersma, Anne: Large-scale karst features and open taliks at Vardeborgsletta, outer Isfjorden, Svalbard.
- Dypvik, Henning, Hvoslef, Svenn, Bjærke, Tor and Finnerud, Egil: The Wilhelmøya Formation (Upper Triassic-Lower Jurassic) at Bohemanflya, Spitsbergen.
- Eiken, Ola: Seismic mapping of the post-Caledonian strata in Svalbard.
- Foldvik, Arne, Gammelsrød, Tor and Tørresen, Tor: Hydrographic observations from the Weddell Sea during the Norwegian Antarctic Research Expedition 1976/77.
- Foldvik, Arne, Gammelsrød, Tor and Tørresen, Tor: Physical oceanography studies in the Weddell Sea during the Norwegian Antarctic Research Expedition 1978/79.
- Foldvik, Arne, Gammelsrød, Tor, Slotsvik, Noralf and Tørresen, Tor: Oceanographic conditions on the Weddell Sea Shelf during the German Antarctic Expedition 1979/80.
- Farrelly, B., Gammelsrød, T., Golmen, L.G. and Sjøberg, B.: Hydrographic conditions in the Fram Strait, summer 1982.
- Unander, Sigmund, Mortensen, Atle and Elvebakk, Arve: Seasonal changes in crop content of the Svalbard Ptarmigan *Lagopus mutus hyperboreus*.
- Krzyszowska, Anna Jadwiga: Tundra degradation in the vicinity of the Polish Polar Station, Hornsund, Svalbard.

Research Note

- Aarset, Arne Vollen and Willumsen, F. V.: Hydraulic based sampling equipment for under-ice fauna.

NOK 80.-

Norsk Polarinstitutt Skrifter

Norsk Polarinstitutt Skrifter Nr. 179C – Vinje, T.: Drift, composition, morphology and distribution of the sea ice fields in the Barents Sea.

This is the third issue in the series on the physical environment of the Western Barents Sea. It includes a map of the sea ice distribution in the Barents Sea for the ten-year period 1971-1980 and gives an updated

statistical review of the ice conditions in the area, based on long-term observations from land stations, satellites, ice drift buoys and ships.

NOK 100.-

Norsk Polarinstitutt Skrifter Nr. 183 –

Bäckström, S. A. & Nagy, J.: Depositional history and palaeontology of a phosphorite conglomerate in the Jurassic of Spitsbergen.

This is a stratigraphical and paleontological analysis of the Brentskardhaugen conglomerate bed and fossils from this bed and the Wilhelmøya Formation. Three brachiopod, 24 bivalve, ten ammonite and two decapod taxa are distinguished, the majority of them illustrated in a Plate section.

NOK 50.-

Norsk Polarinstitutt Meddelelser

Norsk Polarinstitutt Meddelelser Nr. 108 – Barr, S.: Kulturminner på Jan Mayen (Historical remains on Jan Mayen).

Historical remains on Jan Mayen - buildings, graves, memorial plaques, etc., are listed and described in this booklet. The publication is in Norwegian and English with photographs.

NOK 30.-

Årbok 1985

In addition to being the annual report of the Norwegian Polar Research Institute, this yearbook contains two articles of a more popular character. It is the first issue of the Institute's annual report in a new layout.

NOK 20.-

Norsk Polarinstitutt Polarhåndbok

Polarhåndbok Nr. 2 – Hisdal, V.: Geography of Svalbard.

Geography of Svalbard was first published in 1976. The great demand for more copies after it had been sold out, prompted this revised and somewhat enlarged edition, which also includes a map of Svalbard to the scale of 1:2 mill.

NOK 60.-

Norsk Polarinstituttemakart

Norsk Polarinstituttemakart Nr. 1 – Barentshavet.

The first issue in this thematic map series is a sea-bed perspective of the Barents Sea. It is based upon oceanographic and geophysical measurements and investigations by several institutions and is a joint production by 3-D Drawings a/s and Norsk Polarinstituttemakart. Yngve Kristoffersen, Morten Sand, Bengt Beskow, and Yoshihide Ohta have compiled material for the data base and Yngve Kristoffersen is responsible for the Norwegian text. An English version will appear in 1986. Future publications in this series will include thematic maps within the fields of polar geology, biology and geophysics.

NOK 84.-

Research in Svalbard 1985

This is a yearly bulletin which gives information on the scientific work planned to take place in Svalbard during the coming season. It is based on data collected by Norsk Polarinstituttemakart and is distributed to all contributors before the beginning of the season each year.

Norsk Polarinstituttemakart Report Series

The following six papers appeared in the Report Series in 1985, which is published for limited distribution. Reports are not for sale at the Institute, but may be obtained directly from the authors.

Nr. 21 – Lydersen, C., Gjertz, I. & Weslawski, J. M.: Aspects of vertebrate feeding in the marine ecosystem in Hornsund, Svalbard.

Nr. 22 – Report of the Norwegian Antarctic Research Expedition (NARE) 1984/85 (Editor: O. Orheim).

Nr. 23 – Gjertz, I., Mehlum, F. & Gabrielsen, G.: Food sample analysis of seabirds col-

lected during the 'Lance'-cruise in ice-filled waters in Eastern Svalbard 1984.

Nr. 24 – Larsen, Thor: Are Arctic ecosystems vulnerable?

Nr. 25 – Svendsen, Knut: Rapport fra Norsk Polarinstitutts tokt med M/S 'Lance' til Svalbard 17/7-12/8 og 14/8-29/8, 1985 (Tøkt A og B).

Nr. 26 – Elverhøi, Anders: Forskning og overvåkning av det fysiske miljø på arktisk kanadisk sokkel.

Maps and charts

Svalbard 1:100,000 B11 Van Keulenfjorden (77°'-77°'N and 13°'-16°'E), new edition.

NOK 30.- + vat

D9 Agardhfjellet (78°'-78°'N and 17°'-20°'E)

NOK 30.- + vat

Translations of literature carried out at Norsk Polarinstituttemakart in 1985

Biology

Belikov, S. E., Gorbunov, Ju. A. & Sil'nikov, V. I. 1984: Distribution and migrations of some pinnipeds, cetaceans, and of the polar bear in the seas of the eastern region of the Arctic. In: *Marine Mammals*: 233-252. 10 figures, 4 tables, 15 references.

Translated (15 pp.), January 1985

Keskpajk, Ju. E. & Lecht, R. A. (Keskpajk, J. & Leht, R.) 1983: Bioradiometry of heart rhythm of birds in flight. In: *Communications of the Baltic Commission for the Study of Bird Migrations, 15: Biotelemetric and bioenergetic investigations*: 56-65. 9 figures, 1 table, 8 references. Abstract in English p. 65, in Russian p. 122. Tartu, 1983.

Translated (8 pp.), January 1985

Tiskov, A. A. 1983: Ecosystems of the west coast of Spitsbergen (archipelago of Svalbard). In: *Tidings of the Acad. of Sciences of the USSR, series for Geography 1983*: 99-109. 3 figures, 1 table, 30 references.

Translated (13 pp.), September 1985

Voronin, R. N. 1980: Annual cycle of variability of mass of body and of internal organs of the grouse (*Lagopus lagopus* L., Aves) In: *Ekologija* (?): 82-85. 2 tables, 9 references.

Translated (3 pp.), September 1985

Geology

Alechin, S. V. & Verba, M. L. 1979: Dynamics of tectonic processes and fractures of the South Barents Sea Depression. In: *Tectonics of the Arctic. Fractures of the continental shoal and of the ocean*: 18-26. 3 figures. Abstract p. 108. NIIGA, Leningrad.

Translated (7 pp.), February 1985

Danilov, M. A. 1975: Peculiarities of the structure of the terrestrial crust in the region of the Onezskij poluostrov (peninsula) in connection with a prognostication of kimberlitic volcanism in the north of the Russian Platform. In: *Tectonics of the Arctic*, 1: 5-10. 4 figures, 17 references. Abstract p. 80. NIIGA, Leningrad.

Translated (11 pp.), March 1985

Egiazarov, B. Ch., Demenickaja, R. M., Karasik, A. M., Ermakov, B. V., Anikeeva, L. I. & Pol'kin, Ja. I. 1977: Conclusion. In: *Tectonics of the Northern Polar Area of the Earth (Explanatory note to the tectonic map of the Northern Polar area of the Earth on the scale of 1:5,000,000)*: 180-189. NIIGA, Leningrad.

Translated (9 pp.), 1985

Egiazarov, B. Ch. & Romanovic, B. S. 1977: The Atlantic folded belt. Part of Chapter II (Structures on the crust of continental type) of the book: *Tectonics of the Northern Polar Area of the Earth (Explanatory note to the*

tectonic map of the Northern Polar Area of the Earth on the scale of 1:5,000,000): 112-118. NIIGA, Leningrad.

Translated (3 pp.), 1985

Gramberg, I. S., Krasil'scikov, A. A., Dibner, V. D. & Kopylova, T. N. 1984: Prospectives of oil-gas content of the North Atlantic. In: *Problems of the study and of the exploitation of mineral resources of the Global Ocean*: 55-66. 8 references. Abstract p. 157-158. Sevmorgeologija, Leningrad.

Translated (6 pp.), February 1985

Kogan, A. L. & Livsic, Ju. Ja. 1979: On the block structure of the southern part of the Barents Sea Plate. In: *Tectonics of the Arctic. Fractures of the continental shoal of the ocean*: 27-33. 1 figure, 6 references. Abstract p. 109. NIIGA, Leningrad.

Translated (6 pp.), February 1985

Lastockin A. N. & Gjalumbauskajte (Gjalumbauskaite), Z. A. 1983: Multipurposal use of the method of distinctive lines in investigations on the shelf (exemplified by the south-eastern part of the Baltic Sea). In: *Vsesojuznoe geograficeskoe obscestvo, Izvestija*, 115 (1): 11-17. 2 figures, 9 references. Abstract p. 110.

Translated (7 pp.), February 1985

Matisov, G. G. 1982: Role of continental ice in the development of trenches of glacial shelves of the Arctic and of the Subarctic. In: *Geomorfologija 1982*, 2: 20-30. 3 figures, 25 references, English summary p. 30.

Partial translation (8 pp.), June 1985

Punning, Ja.-M., Rajamjæ (Rajamäe), R., Jyers (Jöers), K. & Putnik, Ch. (H.) 1980: List of radiocarbon datings of the Institute of Geology of the Academy of Sciences of the Estonian SSR. V, VI. In: *Tidings of the Academy of Sciences of the Estonian Soviet Socialist Republic 29. Geology, 1980, No. 1*, 34-47. Abstract in English (and Estonian) p. 47 (in Russian p. 48), 6 references.

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Meetings, courses and teaching

The institute staff attended meetings and short courses in Norway, Belgium, Canada, England, the Faroes, France, Iceland, Japan, Netherlands, Poland, Sweden, and West Germany. Anders Elverhøi spent the period 1 February - 1 August as guest researcher at the Arctic Institute of North America, University of Calgary, Canada. Yoshihide Ohta was guest researcher and lecturer at Kyoto University, Japan, from 27 September to 8 December.

The following have held regular lectures and tuition at the University of Oslo:

Liestøl, Olav: Glaciology

Øritsland, Nils Are: Biology

and at the University of Bergen:

Orheim, Olav: Glaciology

Guest lectures at various universities: Ohta, Yoshihide: *Tectonics around the Arctic*. At six universities in Japan, 14 October-27 November

Lectures and conference contributions

Barr, Susan: *Introduksjon til Svalbards historie*. Svalbardkurs, Ny-Ålesund, 17-31 July.

Barr, Susan: *Forskningshistorie på Svalbard*. Svalbardkurs, Ny-Ålesund, 17-31 July.

Elverhøi, Anders: *Geologien i det nordlige Barentshavet*. Barentshavsseminar, Saga Petroleum, 9 October.

Elverhøi, Anders: *Marin og kontinental kvartærkorrelasjon*. Symposium, Ålesund, 20-22 November.

Elverhøi, Anders: *Miljøundersøkelser og konsekvensanalyser i Canada*. Svalbardseminar, Statoil, 11 December.

Gabrielsen, Geir.W.: *Fear in birds and mammals*. Warsaw Univ., Poland, May.

Gabrielsen, Geir.W.: *Diving in Birds*. International symposium on diving in animals and man. Kongsvoll, Norway, 3-7 June.

Gabrielsen, Geir.W.: *Seabird energetics*. Int.symp. on energetics in birds. Groningen Univ., Netherlands, November.

Hjelle, Audun: *Svalbards geologi*. Svalbardkurs, Ny-Ålesund, 22 July.

Holtet, Jan A.: *Research in Svalbard*. ESF Workshop on European Network on Polar Research, Sundvollen, Norway, 28-29 November.

Mehlum, Fridtjof: *The Pro-Mare Project*. Int.symp. on energetics in birds. Groningen Univ., Netherlands, November.

Mehlum, Fridtjof: *Studies of seabirds in Antarctica*. Kiel Univ., Germany, November.

Ohta, Yoshihide: *The recent activities of Norsk Polarinstitutt in the Arctic and the Antarctic*. National Institute of Polar Research, Tokyo, 7 October.

Orheim, Olav: *Erfaringer fra antarktisekspedisjonen med k/v Andenes*. Kystvaktrådet, Oslo, 6 May.

- Orheim, Olav: *Norge i Antarktis*. Sekretærgruppen, Utenriksdepartementet, Oslo, 22 May.
- Orheim, Olav: *Antarktis - ressurser, næringslivsmuligheter, politikk*. Forum for Næringsmessig utvikling i Polarområdene, Oslo, 23 May.
- Orheim, Olav: *Isfjell og isbreer i Antarktis*. Det Norske Videnskaps- Akademi, Oslo, 23 May.
- Rogne, Odd: *Quo Vadis Pro-Mare?* Pro-Mare Meeting, Bergen, 4-6 February.
- Rogne, Odd: *Er vår forskningsinnsats på Svalbard nasjonalt forsvarlig opptrappet?* Fellesrådet for akademikere og politikere, Stortinget, Oslo, November.
- Rudels, Bert: *Blandingsprosesser i farvattnen runt Svalbard*. PRO MARE meeting. Bergen, 4-6 February.
- Rudels, Bert: *Fysisk oceanografi i Arktis*. Svenska Havforskarmötet. Umeå, 18-20 March.
- Rudels, Bert: *Estimates of the exchanges through the Fram Strait from hydrographic observations*. ICES-WG on hydrography. Torshavn, 5-7 June.
- Salvigsen, Otto: *Dating of pre-Late Weichselian sediments in Svalbard*. Intern. daterings-symposium, Lund, 4-7 February.
- Salvigsen, Otto: *Strandkartlegging på Svalbard*. Statoil, Stavanger 12 June.
- Weichselian glaciation in Svalbard. 12th Intern. Radiocarbon Conference, Trondheim, 25-28 June.
- Salvigsen, Otto: *Svalbards kvartærgeologi*. Svalbardkurs, Ny-Ålesund, 22 July.
- Salvigsen, Otto: *Maksimal utbredelse av Sen Weichsel-breene i fjordene på vestkysten av Svalbard*. Symposium om korrelasjon av kontinental og marin kvartærstratigrafi, Ålesund, 20-22 November.
- Salvigsen, Otto: *Strandkartleggingen på Svalbard*. Svalbardseminar, Statoil, Harstad, 10-11 December.
- Solheim, Anders: *NP's marine geological and geophysical research activity*. Oljedirektoratet, Stavanger, 16 April.
- Solheim, Anders: *Den norske antarktisekspedisjonen 1984/85; marine aktiviteter*. Norsk Geografisk Selskap, 25 April.
- Solheim, Anders: *NP's maringeologiske virksomhet og kommende planer i Barentshavet*. Statoil, Stavanger, 12 June.
- Solheim, Anders: *Sea floor evidence for glacier surges, Nordaustlandet Svalbard*. 14th Arctic Workshop, Halifax, 7 December.
- Vinje, Torgny: *Norwegian sea-ice programme in the Fram Strait*. Greenland Sea planning meeting. University of Hamburg, 28-30 April and 30 September-2 October.
- Vinje, Torgny: *Havisforholdene i Barentshavet. Et undersøkelsesprogram*. Norsk Hydro seminar on cold-climate technology. Vettre, Norway 28-29 May.
- Vinje, Torgny: *Ice conditions in the Barents Sea*. Aker Engineering, Norway, 17 October.
- Vinje, Torgny: *Ice transports. Acoustic methods*. Seminar on acoustic measurements and methods. Chr. Michelsens Institutt, Bergen, 30-31 October.

Institute staff

In 1985 the institute had 42 1/2 permanent and 4 1/2 temporary positions, a total of 47. A number of persons were contracted on specified projects for shorter or longer periods of time.

Administration:

Director	Odd Rogne
Research Director	Jan A. Holtet

Office administration

Office Manager	Reidar Lund Otto Gerhard Vaagen (from 1.11)
Accounts	Björg Grimsrud Aud Christiansen (part time)
Telephonist/Receptionist	Nora Lisen Bugge (part time) Mary Caspersen (part time)(from 15.2)
Director's Office	Gro Pedersen (part time) Marit Wiik (part time)
Secretarial	Jorunn Myklebust
Correspondence archive	Bodil Bye Larsen (temporary until 17.8) Ingeborg Christiansen (from 2.9)

Computer services:

Leader	Øivind Finnekåsa Torstein Berge
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Documentation division:

Leader, information officer	Susan Barr
Publications editor	Annemor Brekke
Russian translator	Peter Hagevold
Librarian	Reidunn Lund
Documentation assistant	Inge Marie Mølmen (part time)

Cartographical division:

Leader	Bjørn Arnesen Reidar Mandt Arild Myhrvold Espen Kopperud (part time)
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**Expedition Leader, Arctic, and leader
of Logistics division and Research
Station, Ny-Ålesund:**

Logistics division:

Thor Siggerud
Kåre M. Bratlien
Jørn E. Fortun (until 20.11)
Jan Mikalsen
Odvar Lund
Egil Soglo
Torstein Midtgård (temporary from 16.9)
Knut Hovrud (contract from 7.11)

Research Station, Ny-Ålesund (temporary posts):

Station leader, shared with KBKC

Harald Gule (until 31.3)
Kjell Ljødal (19.3 - 4.10)
Nils U. Hagen (from 20.9)
Håvard Brekke (until 23.3)
Peer Aasarød (until 25.8)
Magne Bentzen (from 17.3)
John Søgaard (from 22.7)
Sigmund Unander (from 20.5)

Engineer

Engineer

Engineer

Engineer

Research fellow

Scientific Divisions:

Biology:

Leader

Thor Larsen (until 31.5)
Nils Are Øritsland (from 1.6)
Fridtjof Mehlum (temporary until 31.5,
contract from 1.6)

Ornithology

Geophysics:

Leader, Glaciologist

Meteorologist

Antarctic, Glaciologist

Oceanographer

Sea Ice

Olav Liestøl
Vidar Hisdal
Olav Orheim
Bert Rudels
Torgny Vinje

Geology:

Leader

Thore S. Winsnes
Audun Hjelle
Ørnulf Lauritzen (until 20.5)
Harald Major (until 30.6)
Yoshihide Ohta
Otto Salvigsen
Hilde B. Keilen (temporary from 5.8)
Anders Elverhøi
Anders Solheim
Jon Erik Møller

Marine geology

Technician

Geodesy/Topography:

Leader, topographer

Geodesist

Topographer

Topographer

Sigurd Helle
Trond Eiken
Bjørn Lytskjold
Knut Svendsen

Post retirement positions:

Geology

Pilot Description

Tore Gjelsvik

Kaare Z. Lundquist

The following left the Institute in 1985:

Harald Major, geologist, 30.6 (retired)

Anne Hamnes, correspondence archive, 14.8

Ingvar Brattbakk, biologist, 31.5 (MAB-project concluded)

Anne Margrethe Holst, engineer, 31.5 (MAB-project concluded)

On leave:

Anne Hamnes, correspondence archive, until 14.8

Nils Are Øritsland, biologist until 31.5 (MAB-project concluded)

Thor Larsen, biologist, from 1.6

Ørnulf Lauritzen, geologist, from 20.5

Contracted for projects:

Nils Are Øritsland, until 31.5 (MAB-project concluded)

Ingvar Brattbakk, biologist, until 31.5 (MAB-project concluded)

Anne Margrethe Holst, engineer part time, until 31.5 (MAB-project concluded)

Geir Wing Gabrielsen, research assistant (financed by NAVF for the project *Seabird ecology in the Arctic*)

Pål Prestrud, biologist, from 1.11 (environmental impact studies)

Accounts for 1985

<i>Chap.1412. Debit items</i>	<i>Granted</i>	<i>Expenditure</i>
01. Salaries, wages, etc.	9,703,000.-	10,051,700.-
11. Goods and services	9,410,000.-	9,565,000.-
21. Special expenses	7,870,000.-	8,756,200.-
45. Large new purchases	896,000.-	1,209,100.-
70. Scholarships	369,000.-	369,000.-
	<u>28,248,000.-</u>	<u>29,951,000.-</u>
<i>Chap.18. Beacons and radio beacons in Svalbard</i>	961,000.-	979,600.-
<i>Chap.4412. Credit items</i>	<i>Budgeted</i>	<i>Received</i>
01. Sale income	150,000.-	289,300.-
03. Income from various services	5,000.-	0
04. Reimbursement from Svalbard budget	1,750,000.-	1,750,000.-
	<u>1,905,000.-</u>	<u>2,039,300.-</u>
<i>Chap.5309.29 Other income</i>		
14 Other income	0	12,200.-

Grants and financial assistance for research projects

Norsk Polarinstitutt gives financial support to polar research at the Norwegian universities and research institutions in the form of fellowships and project grants. Fellowships are granted to individuals, mainly students, to support and stimulate new scientific projects in Svalbard. More extensive management-orientated projects will be supported under the Programme for Biological Research and Investigations in the Arctic.

Fellowships

Hagen, Jon Ove: kr. 65,000.- for glaciological studies of Usherbreen, Svalbard.

Henriksen, Kjell and Stamnes, Knut: kr. 23,000.- for project concerning atmospheric radiation in the Arctic.

Jacobsen, Bjørn: kr. 11,000.- for studies in Ny-Ålesund of aurora dynamics.

Johnsen, Ellen Espolin: kr. 30,900.- towards studies near Ny-Ålesund in botanical ecology.

Kaltenborn, Bjørn: kr. 13,000 for project on Terrain damage in Svalbard due to over-use.

Nilssen, Kjell: kr. 30,000.- towards completion of physiological studies of Svalbard reindeer.

Odasz, Ann Marie Odasz: kr. 9,800.- for preliminary field measurement of temperature variation within the pubescence of *Pedicularis dasyantha*.

Prestholm, Edward: kr. 16,400.- towards general studies of fault activity in Svalbard during the Cretaceous period and special studies of growth faults.

Ringsaker, Torleif: kr. 11,000.- for building, installation and starting of new data and modem system in Ny-Ålesund.

Ryg, Morten: kr. 13,900.- to cover expenses in Ny-Ålesund in connection with ringed seal studies.

Skøyen, Svein: kr. 6,000.- towards soil studies in Svalbard.

Steen, Johan B.: kr. 7,200.- for project near Ny-Ålesund concerning temperature regulation in newborn eider ducks.

Sten, Torleif Abell: kr. 9,000.- for testing of a new meridian scanning fotometer.

Sørnes, Grete: kr. 8,400.- for studies near Ny-Ålesund of peripheral blood vessel response to varying ambient temperatures.

Tolgensbakk, Jon: kr. 4,000.- for geomorphological data mapping at Brøggerhalvøya, Svalbard.

Tryti, Eirik: kr. 9,000.- for installation and starting of new datalog-system in Ny-Ålesund.

Ødegård, Rune: kr. 15,000.- towards detailed mapping of patterned ground at Kvadehuken, Svalbard.

Aarvik, Frode and Vongraven, Dag: kr. 18,000 for project Thermoregulation in young of Brünnichs guillemot near Ny-Ålesund.

Project grants

Elvebakk, Arve, University of Tromsø. Vegetation mapping, kr. 47,000.-.

Hanson, Rasmus, Ministry of the Environment. Polar bear investigations on Kongsøya, kr. 55,000.-.

Nielsen, Kjell, University of Tromsø. Physiological studies of the polar fox, kr. 100,000.-.

Prestrud, Pål, Office of the Governor of Svalbard. Biology of the polar fox, kr. 60,000.-.

Senstad, Erling, SINTEF. Revegetation experiments in Svalbard, kr. 168,000.-.

Sollid, Johan Ludvig, University of Oslo. Quarternary geology, erosion studies, kr. 95,000.-.

Sollid, Johan Ludvig, University of Oslo. Mapping of the coastal zones in Svalbard, kr. 360,000.-.

Jan Mayen – still an active volcano

A short account of the eruption in 1985 and other volcanic activity

The usual picture of Jan Mayen is dominated by Beerenberg on North-Jan, the great ice-covered volcanic cone which rises to a height of 2277 metres.

As late as in 1970 it was stated in volume 10 of a twenty-volume encyclopædia that Jan Mayen was not believed to be an active volcano. This is perhaps not so strange taken into consideration the ice-cover and cold temperatures of the island. In addition, few people in Norway have experience with volcanoes, though the geological structure, and therefore also the landscape, of Jan Mayen is characterized by volcanism with large numbers of craters, solid lava streams, and volcanic ash deposits.

In that year, 1970, Jan Mayen itself protested at the idea of it being extinct and a relatively large eruption occurred in September (see for example *Árbok 1970*, Siggerud, Thor: The volcanic eruption on Jan Mayen 1970).

The eruption gave us cause to re-examine the old descriptions of observations from Jan Mayen which had previously been explained to be sand storms or the like. After having studied both the 1970 eruption and the Heimaøyr eruption in Iceland at a short distance while they occurred, my personal opinion is that Andersson's description from 1732 and Scoresby jr's description from 1818 are good eye-witness accounts of actual volcanic eruptions. The oldest description of a hail of rocks and other phenomena from the 17th century whaling period probably refers to an eruption.

Another fact to be considered when assessing Jan Mayen's volcanism is that the eruption in 1970 sent large masses of lava out into the sea and built up new land. An inspection of the

area in 1972 showed that much of the new land had already eroded away, which gives a demonstration of the enormous erosive force of the sea on a newly-formed lava coast. We can also see that in places where the sea is deeper, the coastline is often structured in the form of several hundred metre high cliffs caused by the action of the sea. A study of the landscape and maps of Jan Mayen with this in mind, indicates that a number of lava streams must be quite young - not just a few years old, but of the order of a few centuries, which geologically speaking is comparatively recent.

Jan Mayen was discovered about 350 years ago. Bearing in mind how sporadic the presence of people has mostly been on the island and how limited the area of settlement is even today, then it is quite possible that several undiscovered volcanic eruptions have taken place during this time.

Even the large eruption in 1970 could have remained undiscovered if there had not been a fortunate coincidence of especially good weather combined with the new airplane routes in the northern areas which have been established in the last years. Had there been full cloud cover for a period from 17th September 1970, something which is quite usual for Jan Mayen, we would probably still have believed that volcanism on Jan Mayen was extinct.

What do we know of more recent volcanic activity on Jan Mayen ? By *volcanic activity* is here meant not only the eruption of red-hot melted stone, but all traces of 'unnatural' heat activity.

When the eruption took place in 1970, a study was made from the air of the whole island to see whether there were signs of volcanic

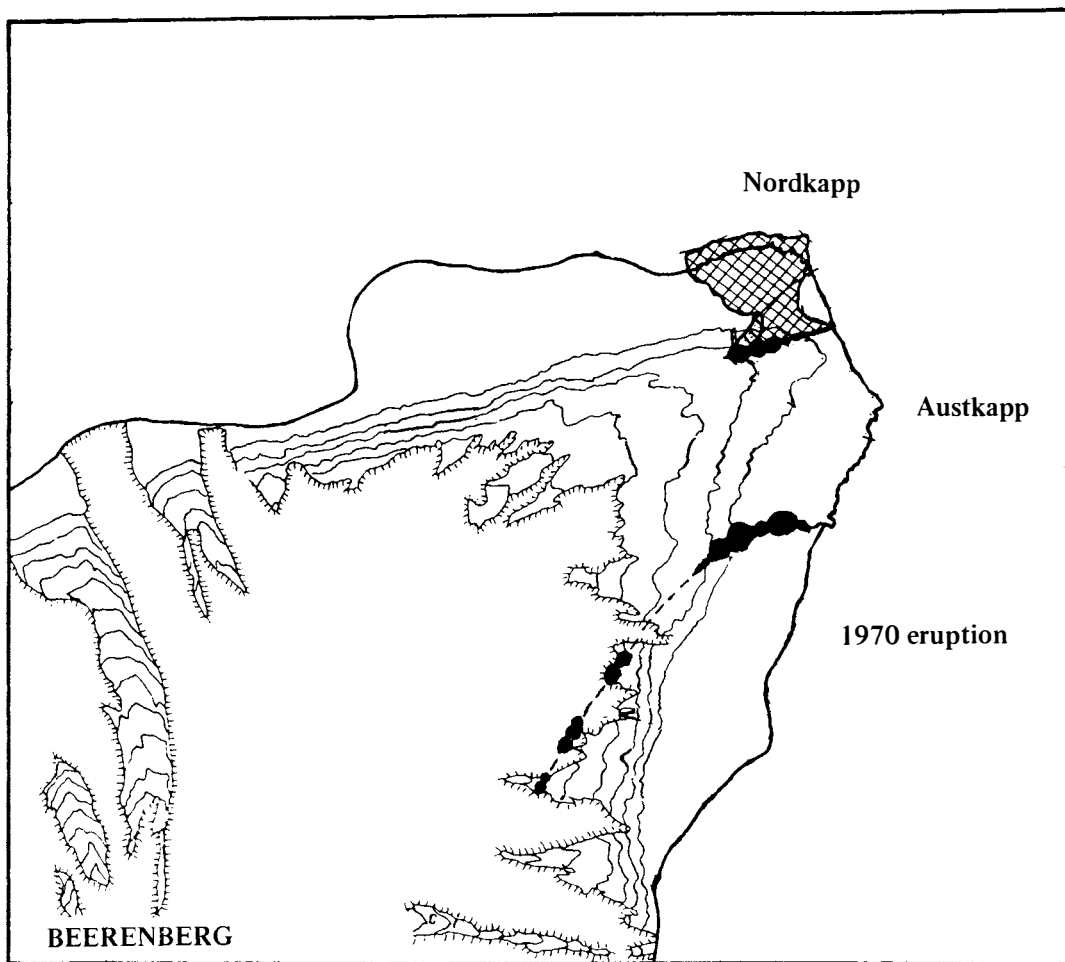


Fig. 10. Map showing the eruption and area of new lava in relation to Beerenberg and the 1970 eruption.

activity any other places than in the new fissure zone on the north flank of the Beerenberg volcano. Of special interest was the large, 1.5 km wide central crater on Beerenberg. No activity was observed anywhere, however, and the central crater is covered in ice and snow on photographs from the time.

In 1971 it was evident that an event had taken place, and after closer inspection in 1972 a large blow-out of steam from the inner northern edge of the central crater was discovered. The ice and snow that had been there in autumn 1970 had melted and there were tracks of a water flow down Weyprechtbreen (W-glacier).

This volcanic activity with a blow-out of overheated steam still continues, in the same

way as there are constant signs of the release of heat from Eggøya. As long as there has been a permanent meteorological station on Jan Mayen (since 1921), there have been reports from the different personnel about steam activity from Eggøya. During flights to the island a small crater was observed in the extreme southwest of the island, where the snow had melted, indicating the escape of heat.

The Jan Mayen island has obviously decided that it may as well continue its volcanic activity; another eruption has now been observed only half a generation after the one in 1970. On January 4th 1985 a series of earthquakes were registered both at the seismic station on Jan Mayen and on seismographs in, for example, Iceland. On the 6th a number of especially

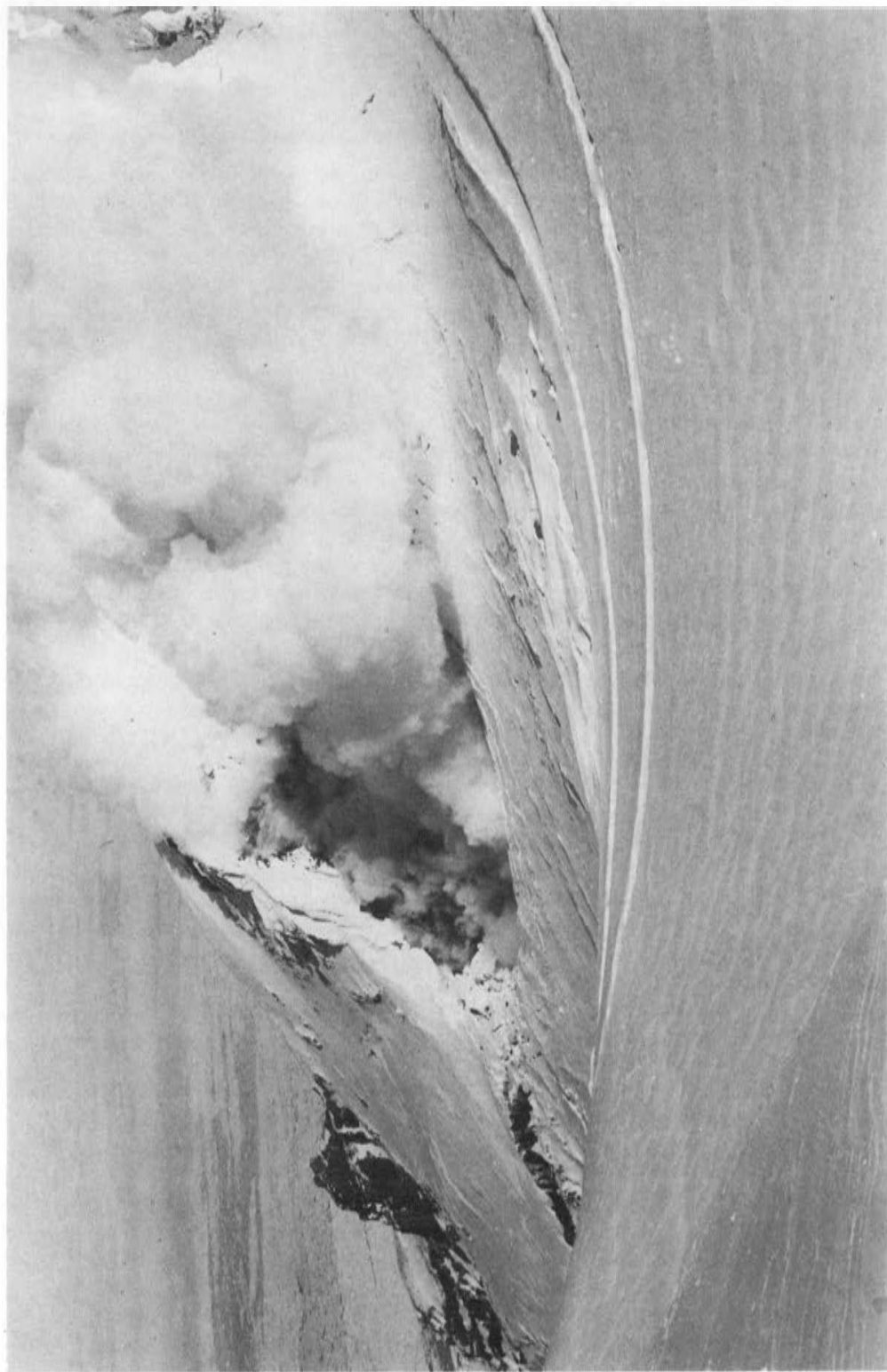


Fig. 11. Steam rising from Beerenburg's central crater in April 1985. Pack ice can be seen on the sea in the background. (Photograph, courtesy of the Norwegian Meteorological Institute).

strong quakes occurred, right up to 5 on Richter's scale. The activity continued into the next day, but the number decreased. Strong quakes also occurred after the 6th, e.g. on the evening of the 7th when another quake with a strength of 5 was registered. From the main station on South-Jan nothing could be directly observed in the winter darkness, until on the evening of the 6th there seemed to be a lightening of the sky over Beerenberg indicating that an eruption might have been taking place.

Earthquake activity needs by no means indicate that an eruption is taking place or is on the way. Jan Mayen does not quite lie on the range of volcanoes stretching along the Atlantic Ocean (the Mid-Atlantic Ridge) between the continental plates, but more or less on a side fissure. At the present time the majority of the earthquakes in the area are associated with movement between the plates to the north of Jan Mayen.

On the morning of the 7th January, a SAS 'plane was able to confirm by direct observation that a volcanic eruption was taking place. The pilot reported that lava was pouring out of a fissure area on Jan Mayen's north point and that a fountain of ash reached up to about 3000 m. An eruption in this part of the island is unfortunately inaccessible from the station which lies 35 km away as the crow flies and on the opposite side of Beerenberg. An attempt was made to organize a flight from Norway to Jan Mayen in order to observe the eruption and to gain a clear idea of events. However, since the eruption was too far from the main station to have any other effect for it than reminding us that there is still active volcanism on the island, it was impossible to obtain funds for the flight.

The distance from Iceland is, however, considerably shorter and an aerial reconnaissance could be carried out from there with smaller and consequently cheaper 'planes. On January 7th therefore, geologists from the Nordic Volcanological Institute in Reykjavik, with Director Dr. Gudmundur Sigvaldasson, flew over the eruption area on Jan Mayen. A landing was obviously impossible, but the 'plane circled over the eruption for over half an hour in the afternoon. Although the light conditions were

difficult with the sun under the horizon, the geologists managed to make many observations. The following factual information about the extent of the lava stream is, therefore, partly based on a conversation with Dr. Sigvaldasson.

The flight over Jan Mayen showed that the volcanism was, as had been assumed, localized to a new fissure in the far northeastern part of the island, north of the site of the 1970 eruption. The fissure ran almost west/east from Sarskrateret about 200 m over sea level, downwards and outwards towards the sea in the east, north of Hohenloekrateret.

The activity seemed to be greatest in the upper part where cones of poured-out lava had been formed (spatter cones). The lava had also poured down towards the sea in the north, but the dark surface would indicate that it had cooled and it was uncertain whether it was still moving.

Volcanic ash was still spurting out of the one cone and followed a gas and heat stream which went up to a height of about 1000 m, then spreading in the wind several kilometres over the sea towards the east and southeast. It had also fallen on land beyond Austkapp, and fine volcanic ash still sifted down on the sea outside. Down on the plain along the lower parts of the fissure, there was no longer any visible signs of activity.

Observation from the 'plane seemed also to show that all the lava which had poured out had run down to and over the Kokssletta plain, and out towards the sea. Steam still arose from the front of the lava mass, indicating that the mass had pushed out into the sea, but it was impossible to estimate the thickness of the lava stream from the air. The appearance indicated that the lava which had pushed forward was of relatively low viscosity, as was the case with the eruption in 1970. It had, at least, poured out so far that Jan Mayen's northernmost point, Nordkapp, was extended some metres further out and new geographical coordinates had to be fixed as a basis for e.g. the defining of boundary lines.

Two days later, on 9th January, observations in the area were made from a Norwegian inspection vessel. The volcanic activity then seemed to have ceased.

The volcanic eruption on Jan Mayen in 1985 was probably only a small one judged from its short duration. It joins the list of such phenomena and reminds us that the volcanic island has by no means congealed all the way through.

However, even though the eruption can be characterized as small, the geologists at the Nordic Volcanological Institute calculated that the lava forced out constituted at least 6 million cubic metres of stone. During the few hours the eruption lasted anyone present to experience it, would no doubt have felt it to be big enough.

There has still been no opportunity to undertake a closer inspection of the site of the eruption owing to its inaccessibility and the cost in both time and money of organizing an expedi-

tion to work there. A study would most probably show that the geological conditions of the latest eruption are relatively similar to those of the large eruption in 1970. The direction of the fissure is somewhat dissimilar, with a 45° divergency. The new fissure runs approximately east/west.

The entire landscape in the area is characterized by the consequences of earlier eruptions of the same type. It would appear that almost the same fissure produced the lava stream now as at the time when Kokksletta and Sarskrateret were formed.

There is no reason to believe that the volcanic eruption in 1985 will be the last one on Jan Mayen.

